CLAIMS

1. A fuel cell comprising:

a hydrogen-permeable metal layer containing a hydrogen-permeable metal;

an electrolyte layer consisting of a metal oxide material exhibiting proton conductivity; and

an intermediate layer disposed between the hydrogen-permeable metal layer and the electrolyte layer and is composed of at least one metal layer,

wherein the metal layer in contact with the electrolyte layer contains a metal element in common with the electrolyte layer.

2. A fuel cell comprising:

a hydrogen-permeable metal layer containing a hydrogen-permeable metal;

a metal intermediate layer that is formed on the hydrogen-permeable metal layer and is composed of at least one metal layer;

a ceramic intermediate layer that is formed on the metal intermediate layer and is composed of at least one metal oxide layer; and

an electrolyte layer that is formed on the ceramic intermediate layer and consists of a metal oxide material exhibiting proton conductivity,

wherein the metal oxide layer in contact with the metal intermediate layer contains a metal element in common with the metal layer in contact with the ceramic intermediate layer, and the metal oxide layer in contact with the electrolyte layer contains a metal element in common with the electrolyte layer.

3. The fuel cell according to Claim 2, wherein the ceramic intermediate layer is composed of a single the metal oxide layer, the metal layer in contact with the ceramic intermediate layer contains a metal element in common with the electrolyte layer and the ceramic intermediate layer, and the ceramic intermediate layer contains a higher percentage of the metal element in common with the electrolyte layer than the electrolyte layer.

4. The fuel cell according to Claim 3, wherein the ceramic intermediate layer is composed of an oxide of a metal comprising a constituent component of the metal layer in contact with the ceramic intermediate layer, and the electrolyte layer consists of a compound oxide material containing multiple metal elements including the common metal element.

5. The fuel cell according to Claim 2, wherein the metal oxide layer that composes the ceramic intermediate layer contains a metal element in common with a layer in contact therewith.

6. The fuel cell according to any of Claims 2 through 5 further comprising:

a composite layer that is disposed between the metal oxide layer composes the ceramic intermediate layer and a layer in contact with this metal oxide layer, and is formed with a mixture of the constituent components of the two adjacent layers.

7. The fuel cell according to any of Claims 1 through 5 further comprising:

a catalyzing layer that is disposed at, among the interfaces of the various layers laminated between the hydrogen-permeable metal layer and the electrolyte layer, the interface of a layer having proton conductivity, exhibits activity that generates protons from hydrogen atoms and further has multiple pinholes that permit the layers above and below the catalyzing layer to come into contact with each other.